

AERMOD Modeling System: Status and Updates

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Outline

- Recap of AERMOD status
- Recent AERMOD developments
 - AERMOD dispersion model
 - AERMAP terrain preprocessor
 - AERMET meteorological preprocessor
- Other AERMOD-related activities

AERMOD Status

- Promulgated as EPA-preferred near-field model in Federal Register notice dated November 9, 2005, with effective date of December 9, 2005, as version dated 04300
- One-year grandfather period expired December 9, 2006
- Significant updates to all AERMOD components released January 2007 (dated 06341), with limited update to AERMOD (dated 07026)
 - AERMOD model changes included enhancements to improve support for urban-scale applications
 - Additional options to vary emissions by month, hour-of-day and day-of-week (MHRDOW, MHRDOW7)
 - Multiple urban areas in single model run
 - Improved memory management
 - Updates to PM-2.5 processing in AERMOD
 - Beta-test options for capped/horizontal releases and for PVMRM PSD-credit option

AERMOD Status - AERMET

- AERMET v06341 updates included significant changes to processing of NWS Integrated Surface Hourly Data (ISHD) surface data (TD-3505)
 - Selection of which record to process for hours with multiple records
 - Processing of cloud cover codes
 - Identify “variable” winds as missing WD and non-missing WS rather than calm
- Several additional bug fixes in AERMET
- Single AERMET executable

AERMOD Status - AERMAP

- Significant changes in AERMAP v06341 related to horizontal datum (NAD) conversion process
 - Previous version did not account for shift due to UTM-Lat/Lon conversion
 - Error typically about 200m in Northing coordinate
 - Incorporated NAD conversion for DOMAIN extent
 - Clarified and simplified treatment of DEM file gaps
- Corrected bug with method to optimize hill height scale calculation by skipping adjacent DEM files
- Enhanced debug output options, fixed several bugs, and incorporated additional optimizations

Recent AERMOD Developments

- Updates to all three AERMOD components completed (dated 08280):
 - To be released on SCRAM ASAP
 - Miscellaneous bug fixes and enhancements for all three AERMOD components (more details on following slides)
 - Improvements in code portability across compilers and platforms (Windows/Linux) for all components
 - Update to Intel Fortran Compiler for distributed executables (about 40% runtime improvement compared to Compaq Visual Fortran)
 - User's Guides being updated to incorporate Addenda & other corrections

Recent AERMOD Changes

- Modified optional urban roughness length to treat values other than 1.0 meter as non-DFAULT (per discussion in Section 5.3 of *AERMOD Implementation Guide*)
- Added options to vary emissions by hour-of-day and day-of-week (HRDOW and HRDOW7)
- Enhanced HOUREMIS option to allow specifying hourly-varying release heights and initial dispersion coefficients for VOLUME and AREA sources
- Corrected significant bug with use of OLMGROUP keyword for OLM option; more details in Addendum to Model Change Bulletin (MCB#3)
- Corrected problems with processing of surface file header for screening meteorology, for interface with AERSCREEN
- Improved efficiency of memory allocation (especially for AREAPOLY)
- Use of DOUBLE PRECISION for nearly all non-integer variables
 - addresses some long-standing and recent issues with precision
 - also improves consistency of results across different compilers, compiler options, and computing platforms

Recent AERMAP Changes

- Fixed problems with processing Alaska DEM files (1-deg, 15-min and 7.5-min data; non-uniform longitude spacing of nodes)
- Support for National Elevation Dataset (NED), available from USGS Seamless Data Server in GeoTIFF format
- Allow “mixed” DEM files (1-deg, 7.5-min, and 15-min for AK); can be used to fill gaps in 7.5-min coverage, such as over water grids; however, no support for mixed DEM & NED data
- Domain keywords (DOMAINXY/DOMAINLL) are now optional; will use all available data if omitted
- Support for INCLUDED keyword on RE and SO pathways
- Modified to use standard convention of negative for West longitude
 - Simplifies code structure and inputs
 - Consistency with other tools (e.g., AERSURFACE)
 - Improves applicability beyond the U. S.
- Allocatable array storage at runtime

Recent AERMET Changes

- Corrected cosmetic bug with user-specified station elevation, incorrectly reported as 100m in Stage 3 report files
- Corrected problems with averaging of sub-hourly inputs for site-specific data
- Make broader use of station elevations from data files (ISHD & SAMSON) and/or user-specified elevations for SURFACE data
- Corrected problems with time zone adjustments for cases with surface and onsite stations in different zones
- Added optional user-specified upper air sounding window, currently hardwired to 11-13Z
- Incorporated changes to handle ISHD files with “problem” addressed on interim basis by *FIXISHD* utility

Other AERMOD-related Activities

- Updating Air Pollution Training Institute (APTI) course 423, “Dispersion of Air Pollution: Theory and Model Application,” to reflect AERMOD model
- Support for in-house applications of AERMOD, including:
 - Application for “Detroit MP Study” to model local-scale impacts of CAPs and HAPs, combined with CMAQ results using “hybrid” approach
 - Model-to-monitor comparisons for Benzene emissions from Texas City refineries for RTR
 - Support to Alabama DEM for Birmingham Area Particulate Study (BAPS) (discussed this morning)
 - Exposure assessment for Atlanta area to support current NO₂ NAAQS review (more on this tomorrow morning)
 - Common themes are meteorological data representativeness and processing, source characterization and emission uncertainties, and model performance on a paired-in-space and/or time basis (more on this tomorrow morning)

Other AERMOD-related Activities

- Developing infrastructure to support more efficient updates to AERMOD modeling system, with full assessment of the impact of model changes
 - Developing more effective procedures to challenge model changes prior to release, including more comprehensive test beds and testing across multiple compilers and computing platforms
 - Automating process of assessing impact of model changes through routine application of consequence analysis databases and model evaluation field study databases
 - Developing procedures for notifying community of significant bugs or other issues, with information on potential impacts, work-around if any, and status of fixes
 - Provide clearer procedures and mechanism for reporting problems with the AERMOD modeling system to EPA and tracking status of response/resolution

Other AERMOD-related Activities

- Assessing application issues related to AERMOD modeling system and coordinating work of AIWG and AERMIC to address these issues
 - Modeling impacts from haul roads
 - Coordination with CRA and other stake-holders in assessing potential updates to AP-42 emission factors
 - Assessing source characterization issues to develop “best practices” recommendations for modeling haul roads
 - Addressing consistency issues across Regions and States
 - Meteorological data representativeness and sensitivity to surface characteristics
 - Conducted AERMOD sensitivity analysis study, presented at A&WMA Annual Conference in June 2008; plans to expand conference paper to more complete EPA report
 - Activities of AIWG to develop better understanding of issue with goal of improving guidance; plans of AERMIC to enhance AERMOD formulation to mitigate this issue (discussed later in this session)

Questions?

